AIP Conference Proceedings 2006 vol.850, pages 899-900

2D inhomogeneous superconducting states and umklapp processes in ferromagnet/superconductor nanostructures

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Abstract

We derive new three-dimensional (3D) boundary-value problem (BVP) for the proximity effect in ferromagnetic metal/superconductor (FM/S) nanostructures. Our theory takes into account the competition between the one-dimensional (1D) and two-dimensional (2D) realizations of the Larkin-Ovchinnikov- Fulde-Ferrell (LOFF) interface states. It is shown that processes of mutual transformation between BCS and LOFF pairs at the FM/S boundary happen through the Umklapp processes during which coherent pair momentum k is conserved with exactness up to the reciprocal LOFF lattice vector g. © 2006 American Institute of Physics.

http://dx.doi.org/10.1063/1.2354994

Keywords

Boundary conditions, Ferromagnetism, Multilayers, Proximity effect, Superconductivity, Umklapp processes